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## NOTES ON NEW ENGLAND HEPATICAE,—X.

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THE genus *Chiloscyphus* is represented in Europe and North America by a number of distinct forms, some of which are terrestrial while others are aquatic or subaquatic in habit. A new impetus to study these forms has been given by the publication of Schiffner's "Kritik der europäischen Formen der Gattung *Chiloscyphus* auf phylogenetischer Grundlage."<sup>1</sup> In this paper six species are recognized, three being terrestrial and three aquatic. The terrestrial species include *Ch. pallescens*, *Ch. polyanthus*, and *Ch. ascendens*, while the aquatic species include *Ch. fragilis*, *Ch. rivularis*, and *Ch. Nordstedtii*. With the exception of the last these species are all definitely known from North America. Schiffner's interpretation differs in certain respects from that given by K. Müller in his "Lebermoose Deutschlands, Oesterreichs und der Schweiz."<sup>2</sup> According to his conclusions *Ch. pallescens*, *Ch. polyanthus*, *Ch. ascendens*, and *Ch. Nordstedtii* represent elementary species, or "kleine Arten"; *Ch. fragilis* and *Ch. rivularis*, on the other hand, are nothing more than inconstant varieties of *Ch. polyanthus*. Müller's position is upheld by Macvicar,<sup>3</sup> who includes both these aquatic forms under *Ch. polyanthus* as varieties and yet admits *Ch. pallescens* as a species. *Ch. ascendens* and *Ch. Nordstedtii*, not having been reported from the British Isles, are not considered by this author. In the opinion of the writer Schiffner's segregation of *Ch. fragilis* and *Ch. rivularis* seems warranted, in view of the evidence at hand and of the prevalent tendency to recognize "kleine Arten."

<sup>1</sup> Beih. zum Bot. Centralbl. 29<sup>2</sup>: 74-116. pl. 1, 2. 1912.

<sup>2</sup> Rabenhorst's Kryptogamen-Flora 6: 822-826. 1911.

<sup>3</sup> Student's Handb. of British Hepatics 240, 241. 1912.



At the same time it must be admitted that culture experiments in the future may necessitate different interpretations. With regard to *Ch. ascendens* the evidence is less convincing; the diagnostic characters separating it from *Ch. pallescens* are both vague and inconstant, and the writer is still inclined to deny it recognition as a species. In any case the discussion given below of these three plants, all of which are widely distributed in eastern North America, may prove of interest. The present paper records also several Hepaticae which are new to New England, the most noteworthy of which is perhaps the rare northern species *Neesiella pilosa*. In conclusion several additions to local state floras are reported.

1. NEESIELLA PILOSA (Hornem.) Schiffn. Hedwigia **47**: 314. 1908. On a ledge at base of cliff. Willoughby Mountain, Willoughby, Vermont (*F. G. Floyd*, 1898). New to New England, but recently reported from Bic, Quebec (*J. F. Collins*) and previously known in North America from Greenland. The range of the species extends across northern Europe into Siberia. The characteristics of this interesting plant were given by the writer in the Bryologist for September, 1911, so that it is unnecessary to repeat them here. The Vermont specimens are very fragmentary. A single carpocephalum with a weathered thallus was received from W. G. Farlow several years ago, but although its reference to *N. pilosa* seemed probable, it was considered unwise to base a definite record upon it. Fortunately more complete material, obtained from the herbarium of G. G. Kennedy, has since been received from Miss Lorenz.

2. LOPHOZIA HATCHERI (Evans) Steph. Bull. de l'Herb. Boissier II. **2**: 159. 1902. *Jungermannia Hatcheri* Evans, Bull. Torrey Club **25**: 417. pl. 346, f. 1-7. 1898. *Lophozia Baueriana* Schiffn. Lotos **51**: (9). 1903. *Barbilophozia Hatcheri* Loeske, Verhandl. Bot. Ver. Prov. Brandenburg **49**: 37. 1907. The writer has already noted this species, under the name *L. Baueriana*, from a single New England locality, namely: Little Saddleback Mountain, Franklin County, Maine (*Chamberlain & Knowlton*).<sup>1</sup> No other New England stations can as yet be reported, but Conklin has recently shown that the species has a wide range in North America, extending from Quebec to British Columbia and California.<sup>2</sup> The synonymy given above is now pretty

<sup>1</sup> RHODORA **10**: 188. 1908. A few additional synonyms may be found here.

<sup>2</sup> Bryologist **15**: 12. 1912.



widely accepted in Europe, in spite of the fact that *L. Hatcheri* is an antarctic species, while *L. Baueriana* is northern in its distribution, no intermediate stations for the plant being known. The first suggestion that the two species were synonymous is due to Loeske.

3. *LOPHOZIA HETEROCOLPA* (Thed.) M. A. Howe, Mem. Torrey Club 7: 108. 1899.<sup>1</sup> On a wet rock containing magnesium. Round Mountain, Franklin County, Maine (*Miss Lorenz*, 1912). Widely distributed in Europe and northern Asia. The range in North America is still incompletely known, but the species has already been reported from Greenland, Ellesmere Land, Yukon, Alaska, Ontario, Wisconsin, Minnesota, British Columbia, and California. *L. heterocolpa* belongs to a group of closely related species, of which *L. Muelleri* (Nees) Dumort. is usually regarded as the type. This group has recently been defined by K. Müller as a subgenus of *Lophozia*, under the name *Leiocolea*.<sup>2</sup> At the present time only two other members of this subgenus, *L. badensis* (Gottsche) Schiffn. and *L. Kaurini* (Limpr.) Steph., are definitely known from New England,<sup>3</sup> although others are surely to be expected. The occurrence of gemmae, borne on upright shoots with differentiated leaves, will serve to distinguish *L. heterocolpa* from most of its allies. The gemmiparous shoots bear some resemblance to those of *L. attenuata* (Mart.) Dumort., a member of the subgenus *Barbilophozia*, the modified leaves being erect and more or less appressed to the stem. These leaves, however, which are in three ranks, are definitely bilobed with dentate or lacerate margins, while the gemmae themselves are ellipsoid bodies. In *L. attenuata* the gemmiparous leaves are in only two ranks, they are truncate at the apex and shortly but irregularly two- or three-lobed, and the gemmae are more or less angular. In the subgenus *Leiocolea* the only other species in which gemmae have been described is *Lophozia harpanthoides* Bryhn & Kaalaas,<sup>4</sup> known from Ellesmere Land, Greenland, and King Oscar Land. In this arctic plant the leaf-cells are a little smaller than in *L. heterocolpa*, although their trigones are better developed. The gemmae also are said to differ in their subreniform outline and purple color, those of *L. heterocolpa* being usually constricted in the middle and reddish brown. Aside from the absence

<sup>1</sup> A full synonymy may be found here.

<sup>2</sup> Rabenhorst's Kryptogamen-Flora 6: 711. 1910.

<sup>3</sup> See Evans, RHODORA 12: 197, 198. 1910.

<sup>4</sup> Rep. Second Norwegian Arctic Exped. in the "Fram" 11: 31. 1906.



of gemmae *L. Muelleri* can be distinguished from *L. heterocolpa* by the sharper lobes of the leaves, by the slightly larger leaf-cells, and by the smaller trigones. In most other respects the two species are very much alike and have often been confused.

4. *LOPHOZIA OBTUSA* (Lindb.) Evans, Proc. Wash. Acad. 2: 303. 1899. *Jungermannia obtusa* Lindb. Musc. Scand. 7. 1879. On a shaded bank, mixed with mosses. Round Mountain, Franklin County, Maine (Miss Lorenz, 1912). The third North American station for the species, the other two being at much higher latitudes, in Alaska and Ellesmere Land, respectively. The plant is widely distributed in Europe but is nowhere abundant. It has not yet been reported from Asia. Since *L. obtusa* is figured and fully described in the recent manuals of K. Müller and Macvicar, only its most striking peculiarities need be mentioned here. The plants rarely grow in pure mats but usually straggle through tufts of other bryophytes. They vary in color from yellowish to dark green and bear a superficial resemblance, as Müller has pointed out, to the much commoner *L. barbata* (Schmid.) Dumort. The leaves, however, will at once separate the species. Instead of being four-lobed, as is usual in *L. barbata*, they are almost invariably only two-lobed, and the lobes are further characterized by being rounded or very obtuse at the apex. In most cases the postical lobe is a little larger than the antical, and there is a tendency on slender stems for the lobes to be somewhat sharper than is normal. Fortunately robust stems with the lobes in typical condition are usually present. The underleaves are very rudimentary and cannot easily be demonstrated. This peculiarity, the absence of specialized gemmiparous shoots, and the larger size will at once distinguish *L. obtusa* from *L. heterocolpa*, in which also the lobes are normally blunt. In spite of its bilobed leaves *L. obtusa* apparently belongs in the subgenus *Barbilophozia* and is placed there both by Müller and by Macvicar. The Maine specimens of *L. obtusa* and of *L. heterocolpa* were determined by Miss Lorenz, who has kindly supplied the writer with illustrative material.

5. *CHILOSCYPHUS ASCENDENS* (Hook. & Wils.) Sulliv.; Gray's Manual, Ed. I. 691. 1848. *Jungermannia ascendens* Hook. & Wils.; Drummond, Musc. Amer. St. Merid. 165. 1841. The original material of this supposed species was collected by Drummond at St. Louis, Missouri, and distributed, as indicated above, in his second series of exsiccatae. Soon afterwards Sullivant detected it at Colum-



bus, Ohio, and before long it was found to have a wide distribution in the United States and Canada. In distinguishing *Ch. ascendens* Sullivant laid most stress on the long and irregularly lacerate-toothed lobes of the perianth, those of the allied *Ch. polyanthus* being short and nearly entire. His figure<sup>1</sup> does not show these lobes very clearly but brings out the fact that the calyptra is enclosed by the perianth even after the capsule has been extruded. In *Ch. polyanthus*, as European writers have always insisted, the calyptra projects beyond the perianth at maturity. Although *Ch. polyanthus* was the only species with which Sullivant definitely compared *Ch. ascendens*, Nees von Esenbeck<sup>2</sup> had already recognized two species which might well have been considered in connection with it. These were *Ch. pallescens* (Ehrh.) Dumort. and *Ch. lophocoleoides* Nees, the latter proposed as a new species. In *Ch. pallescens* the calyptra was said to be frequently exerted, while in *Ch. lophocoleoides* it was said to remain hidden within the perianth. *Ch. lophocoleoides* never received much recognition as a species and at the present time is regarded by most writers as a form or poorly characterized variety of *Ch. pallescens*. This implies of course that the perianth of *Ch. pallescens* is subject to considerable variation in length, being sometimes shorter than the calyptra and sometimes longer, and the natural inference would be that *Ch. ascendens* was even more closely related to *Ch. pallescens* than to *Ch. polyanthus*. About eight years ago the writer<sup>3</sup> called attention to this close relationship and showed further that no constant differential characters could be drawn from the underleaves, as certain writers had attempted to do. It was therefore suggested that *Ch. ascendens* should be regarded as a simple synonym of *Ch. pallescens*.

Since this time, however, Stephani,<sup>4</sup> as well as K. Müller and Schiffner, has accepted *Ch. ascendens* as a valid species, distinct from *Ch. pallescens*, although Schiffner is careful to designate it as a "kleine Art," closely related to both *Ch. pallescens* and *Ch. polyanthus* and to a certain extent intermediate between them. According to Schiffner's statements it differs from *Ch. pallescens* not only in its larger perianth but also in its smaller leaf-cells, the latter approaching in size those of *Ch. polyanthus*. At the same time he admits that the leaf-cells in

<sup>1</sup> Gray's Manual Ed. II. pl. 7. 1856.

<sup>2</sup> Naturgeschichte der europ. Lebermoose 2: 364. 1836.

<sup>3</sup> RHODORA 7: 54. 1905.

<sup>4</sup> Bull. de l'Herb. Boissier II. 8: 144. 1908.



*Ch. pallescens* are subject to more or less variation, being sometimes no larger than in *Ch. polyanthus*, and he intimates that some of the European forms which have been included under *Ch. pallescens* and which have perianths equalling the calyptra in length ought perhaps to be referred to *Ch. ascendens* rather than to *Ch. pallescens*. He further confirms the statement of K. Müller that the Siberian variety *grandicalyx* Lindb. & Arnell,<sup>1</sup> included by its authors under *Ch. polyanthus*, really represents *Ch. ascendens*, so that the known range of the plant is northern North America and Asia with a possible extension into Europe.

Although Schiffner separates *Ch. ascendens* from its allies on the basis of two differences only, Stephani and K. Müller find further differential characters in the male inflorescence. According to Stephani the androecia form slender branches arising from the stem, the bracts being small and saccate with an obtuse antical lobule. K. Müller describes male branches of the same type, adding that they arise in the axils of the underleaves and that they can easily be overlooked on account of their minute size. According to him the bracts are ovate with a lunulate sinus and a basal inflexed lobe which encloses a single antheridium. He also states that antheridia are often borne at the bases of leaves on normal branches, a type of inflorescence characteristic of *Ch. polyanthus*, *Ch. pallescens*, and the other members of the genus *Chiloscyphus*, as recently restricted by Schiffner.<sup>1</sup> On the basis of these observations Müller concludes that *Ch. ascendens* is a connecting link between the restricted *Chiloscyphus* and *Heteroscyphus*,<sup>2</sup> a genus segregated by Schiffner from the comprehensive genus *Chiloscyphus*, as defined by the older writers. In *Heteroscyphus*, which is made up largely of tropical and antarctic species, the male branches are invariably small and specialized. Schiffner hesitates to accept the descriptions of the androecia as given by Stephani and Müller and states that he has never found a male inflorescence in *Ch. ascendens* which differs from the normal *Chiloscyphus* type. He therefore refuses to admit that *Ch. ascendens* is intermediate between *Chiloscyphus* and *Heteroscyphus*. In examining a large series of specimens from various parts of North America the writer has seen nothing to contradict the statements of Schiffner, all of the androecia found agreeing closely with those in typical *Chiloscyphus* species. What

<sup>1</sup> Kongl. Sv. Vet. Akad. Hand. 23<sup>5</sup>: 24. 1889.

<sup>2</sup> Oesterr. Bot. Zeitschr. 60: 169. 1910.



the short male branches described by Stephani and Müller really represent is difficult to determine. Possibly they belong to some other species mixed with the plant in question. In any case, if they are never produced by the true *Ch. ascendens*, one of the most important differences between this species and its allies falls away.

Müller adds further that the female inflorescence is borne on a branch springing from the axil of an underleaf, that the perichaetial bracts equal in size or exceed the other leaves, and that their margins are not toothed but often bear gemmae in small numbers. He finds gemmae also on the lobes of the perianth and on the male bracts and compares them with the gemmae of *Lophocolea minor* Nees. The writer has sought in vain to confirm these various statements. He finds instead that the female branches are always lateral, that the perichaetial bracts are smaller than the normal leaves and variously lobed or cleft, and that no gemmae whatever can be demonstrated. Here again the possibility of an admixture in Müller's material suggests itself.

It will be seen from the foregoing remarks that *Ch. ascendens* is based on very vague characters. Even the differences in the size of the leaf-cells, upon which Schiffner places most reliance, are open to criticism. In the specimens distributed by Underwood and Cook,<sup>1</sup> for example, which are cited by Schiffner as belonging to *Ch. ascendens*, the marginal cells average 35  $\mu$  in width and the median cells about 50  $\mu$  in length. And yet in the Californian specimens collected by Baker and Nutting and referred by Schiffner to *Ch. pallescens* the cells give almost identical measurements. By computing averages from four specimens determined by Schiffner as *Ch. ascendens* the marginal cells were again found to measure 35  $\mu$  in width, while the median cells were only 47  $\mu$  in length. Similar averages from four specimens referred to *Ch. pallescens* yielded 35  $\mu$  for the marginal cells and 51  $\mu$  for the median cells. A mean difference of only 4  $\mu$  in the length of the median leaf-cells is surely of very slight significance, especially in plants where the cells are subject to so much variation in size.

On a cursory examination the perianths still seem to yield differential characters of importance. In a typical *Ch. pallescens* these organs are small and deeply trifid with more or less spiny lobes. The lobes

<sup>1</sup> Hep. Amer. 125.



are erect or more or less spreading and the portion of the perianth below them is cylindrical or slightly flaring in the upper part. As the capsule approaches maturity the calyptra grows out beyond the perianth. In *Ch. ascendens* the perianth is large and only slightly trifid, although the margins are much the same as in typical *Ch. pallescens*. The lobes themselves sometimes spread widely and sometimes bend inwards until almost in contact. The portion of the perianth below the lobes is strongly inflated but sometimes presents the appearance of being contracted in the upper part. Even at maturity the perianth exceeds the calyptra in length. Between these two extremes, however, are numerous intermediate conditions. Some of these are noted by Schiffner, who states that he does not attach very great importance to differences in the size or form of the perianth or in the relative lengths of perianth and calyptra. Under *Ch. lophocoleoides*, for example, which he considers a variety of *Ch. pallescens*, he calls attention to plants from Tirol and Salzburg in which the perianth agrees essentially with that of *Ch. ascendens*, while the leaf-cells are larger than in what he considers the typical form of that species. Under *Ch. ascendens* he notes a plant from Norway with the cells of *Ch. ascendens* and a perianth approaching that of the same species but a little smaller and less inflated than in the American and Siberian specimens which he had studied. These are the forms which he suggests may belong to *Ch. ascendens*, although he leaves their determination in doubt.

The writer in his own experience has sometimes found very diverse perianths even in a single tuft of plants. In fact the range of variation is so wide and at the same time so indefinite that it seems impossible to separate *Ch. ascendens* from *Ch. pallescens* on the basis of characters drawn from the perianth. There are, indeed, intermediate forms between the two extremes which one student might refer to *Ch. ascendens* but which another student with equal reason might refer to *Ch. pallescens*. This being the case it seems advisable to include *Ch. ascendens* under *Ch. pallescens* as a slightly aberrant form. There is even a question as to whether *Ch. pallescens* ought to be separated specifically from *Ch. polyanthus*. Schiffner considers it a matter of taste whether it be looked upon as a "kleine Art," a subspecies, or a variety. The difference in the size of the leaf-cells is the only character in which he places much confidence, and this he admits is far from constant. If, however, *Ch. ascendens* is included under



*Ch. pallescens* the species will then present a range of variability in the perianth which far exceeds anything found in *Ch. polyanthus*. It seems logical, therefore, to recognize *Ch. pallescens*, at least as a "kleine Art."

6. *CHILOSCYPHUS FRAGILIS* (Roth) Schiffn. Lotos 58: (27). 1910; Beih. zum Bot. Centralbl. 29<sup>2</sup>; 90. pl. 1, f. 7-14; pl. 2, f. 20, 21. 1912. *Jungermannia fragilis* Roth, Fl. Germ. 3<sup>1</sup>: 370. 1800. *Chiloscyphus polyanthus*, var. *erectus* Schiffn. Lotos 48: 332. 1900. *Ch. polyanthus*, var. *fragilis* C. Müll. Frib.; Rabenhorst's Kryptogamen-Flora 6: 823. 1911. In pools, slow streams, and wet meadows. Maine: Auburn (E. D. Merrill); Round Mountain Lake, Franklin County (Miss Lorenz). New Hampshire: Fraconia Notch (A. W. E.). Massachusetts: Magnolia (W. G. Farlow). Connecticut: Bethany, Middletown, Winchester, and Windsor (A. W. E.); Killingworth (G. E. Nichols). The Massachusetts station has already been recorded by Schiffner. Until very recently the aquatic and subaquatic forms of *Chiloscyphus* were indiscriminately referred to *Ch. polyanthus*, var. *rivularis*. A few years ago, however, Warnstorff<sup>1</sup> brought out the fact that these forms exhibited considerable diversity, and Loeske<sup>2</sup> soon afterwards restricted the name *rivularis* to a definite series of forms, separating them from *Ch. polyanthus* as a distinct species (see below). The remaining forms included by the older writers under the variety *rivularis* have since been more clearly defined by Schiffner, who has revived for the series the old name *fragilis*, as indicated above, and restored it to specific rank.

According to Schiffner's description *Ch. fragilis* is considerably larger than its allies, the stems being thick and fleshy and the leaves often attaining a length of 2 mm. or more. The stems are rarely branched, the leaves are rotund-quadrate in outline and usually as broad as long, while the leaf-cells in typical forms of the species are among the largest in the genus, measuring 35-40  $\mu$  just within the margin. In the American variety *Sullivantii* Schiffn., however, he recognizes a form in which the submarginal cells are only 30  $\mu$  in diameter. The perianth agrees closely with that of *Ch. polyanthus* and is far surpassed by the calyptra when the capsule reaches maturity.

The variety *Sullivantii*, based upon Sullivant's Musci Alleg. No. 248, seems to be not uncommon in New England. The Massachu-

<sup>1</sup> Kryptogamenfl. der Mark Brandenburg 1: 252. 1902.

<sup>2</sup> Verhandl. Bot. Ver. Prov. Brandenburg 46: 172. 1904.



setts specimen is referred to this variety by Schiffner himself and agrees closely with most of the specimens from Connecticut. Instead of growing in quiet pools, where typical forms of the species flourish, the variety grows on rocks and stones in brooks. Schiffner states that no similar form has been found in Europe and suggests that the American plant ought perhaps to be raised to specific rank. Aside from the slightly smaller leaf-cells, however, it seems to show no good differential characters, and it is probable that the differences in the size of the cells are associated in some way with the differences in habitat. In any case the writer is inclined for the present to include the var. *Sullivantii* among the forms of *Ch. fragilis*.

Although there is usually little difficulty in recognizing *Ch. fragilis*, the diagnostic characters, as indicated above, are drawn from differences in general appearance, in habit, and in size, rather than from morphological or structural differences. Even the size of the leaf-cells, which Schiffner emphasizes especially, is subject to considerable variation, and the differences in the form of the leaves are too slight and too inconstant to be considered seriously. According to Müller the characteristic features of *Ch. fragilis* are due entirely to environmental factors and disappear when the plant establishes itself in drier localities. Under these circumstances, in his opinion, the plant becomes quite indistinguishable from *Ch. polyanthus*. Schiffner shows pretty conclusively that this is not the case. He describes a variety *subterrestris* of *Ch. fragilis*, which grew in a locality alternately wet and dry, and shows that this is distinct from *Ch. polyanthus*. He admits also a variety *submersus* Loeske of *Ch. polyanthus*, which has slightly larger cells than the typical form of the species but which is evidently distinct from *Ch. fragilis*. According to Macvicar, who retains *Ch. fragilis* as a variety under *Ch. polyanthus*, the plant is even closer to *Ch. pallescens* and cannot always be distinguished from it. He emphasizes the more opaque and rarely emarginate leaves, those of *Ch. pallescens* being translucent and frequently emarginate.

Aside from the New England stations listed above, *Ch. fragilis* may be recorded from the following North American localities: Torbay, Newfoundland (*Howe & Lang, 1858*); near Montreal, Quebec (*Dupret*); Port Renfrew, Vancouver Island (*Miss Gibbs*); Tacoma, Washington (*Flett*); Yosemite Valley, California (*Cooke*); Tate Mine, near Marysvale, Utah (*Jones*). The last named specimen belongs to the variety *calcareus* Schiffn.



7. *CHILOSCYPHUS RIVULARIS* (Schr.) Loeske, Verhandl. Bot. Ver. Prov. Brandenburg 46: 172. 1904. *Jungermannia pallescens*,  $\beta$  *rivularis* Schrad. Syst. Samml. Krypt. Gew. 2: 7. 1797. *Chiloscyphus polyanthus*,  $\beta$  *rivularis* Nees, Naturgeschichte der europ. Leberm. 2: 374. 1836. Submerged in brooks, sometimes exposed to the air through the drying up of the water. New Hampshire: Shelburne (*W. G. Farlow*); Waterville (*Miss Lorenz*). Vermont: Jerico (*A. W. E.*); Newfane (*A. J. Grout*). Massachusetts: Lynn, Reading, and Woburn (*C. C. Kingman*). Rhode Island: Cranston (*J. F. Collins, 1851a*). Connecticut: New Haven and Ledyard (*A. W. E.*); Bolton, East Haven, Portland, and Stafford (*G. E. Nichols*); Canterbury (*Mrs. Hadley*); Plainfield (*J. L. Sheldon*). Widely distributed in North America, the known range extending from Newfoundland west to British Columbia and south to Pennsylvania and California.

The present species, as understood by Schiffner, is apparently the most abundant representative of the genus in North America as well as in Europe. In its most typical condition the shoots, which are about half as large as in *Ch. fragilis*, develop numerous widely spreading branches, the leaves are deep green in color and longer than broad, while the leaf-cells are small, averaging about  $25\ \mu$  in the middle of the leaf. The perianth is much the same as in *Ch. polyanthus*, and the calyptra is exerted at maturity. Apparently perianths are never produced when the plants are completely submerged but only when they are more or less exposed to the air. This fact is brought out by Schiffner, who also calls attention to the changed appearance of the plants under these circumstances. The branches, for example, are less numerous and spread more obliquely, while the leaves become more crowded and acquire a paler and more yellowish hue. In other words these subterrestrial modifications (*forma subterrestris* Schiffn.) show a striking resemblance to ordinary *Ch. polyanthus*. According to Müller they actually represent *Ch. polyanthus* and he therefore considers *Ch. rivularis* a mere environmental form and unworthy of recognition as a species. Schiffner, on the other hand, maintains that his position (which is also that of Loeske) is correct and that the subterrestrial forms of *Ch. rivularis* merely resemble *Ch. polyanthus* superficially without losing their specific characteristics. He points out, among other things, that they still retain their small leaf-cells although he admits that the cells are not quite so small as in typical submerged conditions. He describes, however, a new submerged



variety (var. *subteres* Schiffn.) in which the cells are fully as large as in the subterrestrial modification of the typical form. According to his account this variety also passes over into a subterrestrial condition, which he implies is quite indistinguishable from that of the typical form. He supports his position still further by citing a locality in Bohemia where typical *Ch. polyanthus* and the subterrestrial form of *Ch. rivularis* grow side by side and even intermingled without passing into each other. Schiffner regards *Ch. rivularis* as a species with a wider range of variability than is ascribed to it by Loeske and considers this variability as one of the peculiarities of the plant.

In North America the typical *Ch. rivularis* seems to have been rarely collected. Much of the material examined by the writer belongs to the variety *subteres*, characterized not only by its larger leaf-cells but also by its less squarrose branches and by its larger and more crowded leaves. The latter are not explanate as in the normal form of the species but are more or less ascending and often give the branches a subterete appearance. The forma *subterrestris*, also, is known from a number of localities. Although *Ch. polyanthus* has been recorded from each of the New England states, the exclusion of the forms now referred to *Ch. fragilis* and *Ch. rivularis* reduces the number of New England stations which the writer can definitely quote to two, namely: Katahdin Iron Works, Maine (*E. D. Merrill*) and Brookfield, Connecticut (*A. W. E.*). *Ch. pallescens* seems to be more abundant. Specimens have been examined from Maine, New Hampshire, Massachusetts, and Connecticut, and the species is reported also from Rhode Island (under the name *Ch. ascendens*) in Bennett's "Plants of Rhode Island."

8. CEPHALOZIELLA BIFIDA (Schreb.) Schiffn. Lotos **48**: 340. 1900. *Jungermannia bifida* Schreb.; Schmidel, Icon. Plant. et Anal. Ed. II. 250 (footnote). pl. 64, f. II. 1797. *Cephalozia bifida* Lindb. Musc. Scand. 4. 1879. On sandy and turfy earth. Massachusetts: Magnolia (*W. G. Farlow*); Reading (*C. C. Kingman*). Connecticut: Hamden and Middlefield (*A. W. E.*); East Hartford and Groton (*Miss Lorenz*). The determinations of *C. bifida* and of the following species of *Cephaloziella* were made by Professor Douin, of Chartres, France. At the present time the limits of *C. bifida* are not clearly understood, so that it is difficult to give an idea of its geographical distribution. It has been reported, however, from numerous scattered localities in Europe, Asia, and North America.



According to Macvicar<sup>1</sup> *C. bifida* should include *C. Hampeana* (Nees) Schiffn. as a synonym, but both Schiffner and Douin advocate keeping them apart, at least tentatively. The species shares with *C. Hampeana* its autoicous inflorescence, its bifid leaves with entire lobes and its sparingly dentate or subentire bracts and bracteoles. The leaves, however, as Schiffner points out, are smaller than those of *C. Hampeana*, the lobes are narrower, being usually only four cells wide at the base, the sinus is also narrower because the lobes spread less widely, and the leaf-cells have thicker walls. Whether the plant is actually the same as *Jungermannia bifida* Schreb. is perhaps doubtful. Lindberg considered that they were probably identical but did not state that he had examined an authentic specimen of Schreber's plant. This was described and figured from German specimens, but although the original account indicates a species of *Cephaloziella*, it does not point to any definite species with certainty. The synonymy of the plant, on the whole, is in need of further elucidation.

9. CEPHALOZIELLA BYSSACEA (Roth) Warnst. Kryptogamenfl. der Mark Brandenburg 1: 224. 1902. *Jungermannia byssacea* Roth, Fl. Germ. 3<sup>1</sup>: 307. 1800. *J. divaricata* Smith; Sowerby, Eng. Bot. pl. 719. 1800. *Cephalozia byssacea* Dumort. Recueil d'Obs. sur les Jung. 18. 1835. *Jungermannia Starkii* Nees, Naturgeschichte der europ. Leberm. 2: 223. 1836. *Cephalozia Starkii* Dumort.; Cogniaux, Bull. Soc. roy. Bot. de Belgique 10: 285. 1872. *Cephalozia divaricata* Dumort. Hep. Europ. 89. 1874. *C. divaricata*,  $\beta$  *Starkii* Spruce, On Cephalozia 64. 1882. *Cephaloziella divaricata* Schiffn.; Engler & Prantl, Nat. Pflanzenfam. 1<sup>3</sup>: 99. 1895. *Cephaloziella Starkii* Schiffn. Lotos 48: 341. 1900. On rocks, banks, sandy earth, and rotten logs. New Hampshire; Lower Greeley Pond, Waterville (*Miss Lorenz*). Massachusetts: Gloucester (*W. G. Farlow*); Saugus (*C. G. Kingman*). Connecticut: New Haven (*J. A. Allen*); East Haven, North Haven, and Ledyard (*A. W. E.*); Vernon (*G. E. Nichols*). The East Haven specimens were distributed in Underwood & Cook's Hep. Amer. 155, as *Cephalozia divaricata*. The species is very widely distributed in Europe, Asia, and North America.

At the present time three names are being used for the above plant, namely: *C. byssacea*, *C. divaricata*, and *C. Starkii*. Those who use the first name follow the authority of Heeg,<sup>2</sup> who studied Roth's original

<sup>1</sup> Student's Handb. of British Hepatics 275. 1912.

<sup>2</sup> Verhandl. der k. k. zool.-bot. Gesellsch. in Wien 43: 96. 1893.



material in the Lindenberg herbarium and pronounced it identical with *Jungermannia Starkii* Nees. Those who use the second name may well base their choice on the statements of Spruce,<sup>1</sup> who examined Smith's original specimens, collected "on heaths, near Holt, Nov. 1798," by Rev. Mr. Francis, and found that they too were identical with *J. Starkii*. Those who use the third name maintain that both *byssacea* and *divaricata* have been used in so many different senses that the names no longer have definite meanings. The adherents of the first two names, according to the principles of priority, seem to have more in their favor. Unfortunately both *J. byssacea* and *J. divaricata* were published in the same year, 1800, so that the employment of either must rest on a purely arbitrary choice. In selecting *byssacea* rather than *divaricata* the writer merely follows the example of Warnstorf and Macvicar.

In its restricted sense *C. byssacea* is characterized by a dioicous inflorescence, by entire leaf-lobes, by more or less distinct underleaves, and by sharply toothed bracts and bracteoles. The older writers, however, including Spruce, understood the species in a much broader sense, including under it *C. Hampeana*, *C. bifida*, *C. papillosa*, and probably other species which are now considered distinct. The older records of *C. byssacea* (and *C. divaricata*), therefore, should not be accepted without re-examination.

10. CEPHALOZIELLA PAPILLOSA (Douin) Schiffn. Oesterr. Bot. Zeitschr. **55**: (5). 1905. *Cephalozia asperifolia* C. Jens. Meddel. om Grønland **15**: 372. f. 1-5. 1898. *C. divaricata*, var. *scabra* M. A. Howe, Mem. Torrey Club **7**: 129. 1899. *C. papillosa* Douin Rev. Bryol. **28**: 72. 1901. *Cephaloziella Douinii* Schiffn.; Douin, l. c. (in obs.). *Cephalozia asprella* Steph. Bull. de l'Herb. Boissier II. **8**: 507. 1908. *Cephaloziella byssacea*, var. *asperifolia* Macv. Student's Handb. British Hepatics 275. 1912. On rocks. Melrose, Massachusetts (C. C. Kingman). Meriden, Connecticut (*Miss Lorenz*). New to New England. Widely distributed in Europe and North America. The present species, although striking in appearance when typical, is very closely related to *C. byssacea*. It is characterized by its rough leaves, the roughness being due to small cuticular papillae or to larger outgrowths composed of one or more projecting cells. Oftentimes the margins of the lobes are more or less dentate or even spinose-dentate at the base. Unfortu-

<sup>1</sup> Ann. & Mag. Nat. Hist. II. **4**: 112. 1849.



nately these peculiarities are not always present, many of the leaves being smooth and with entire lobes, and the occurrence of plants of this character makes it difficult to define *C. papillosa* sharply. The difficulty is clearly stated by Howe, in his account of the variety *scabra*, and deterred him from describing the plant as a distinct species. Even Douin and Schiffner, who admit its validity, do so tentatively and state expressly that it is nothing more than a "kleine Art," or a species in process of formation. Possibly the roughness of the leaves is brought about by external factors, and Douin suggests that it may be associated with a slow growth of the plant and with the development of gemmae.<sup>1</sup> This idea, however, can be regarded as nothing more than an hypothesis, especially since smooth and rough forms sometimes grow together and since smooth forms sometimes produce gemmae.

It will appear from the synonymy that the specific name *asperifolia* is older than *papillosa*. Unfortunately the first name is not available, on account of an earlier *Cephalozia asperifolia* (Tayl.) Spruce,<sup>2</sup> from the Madeira Islands. This plant is known at the present time from Taylor's original description only. On the basis of this description Spruce first referred the species to the genus *Anthelia*<sup>3</sup> but afterwards transferred it to the subgenus *Prionolobus* of the genus *Cephalozia*. Stephani retains it in the same position.<sup>4</sup> According to Mitten<sup>5</sup> the Madeira species is synonymous with *Trigonanthus dentatus* (Raddi) Mitt., but this idea is not tenable because *T. dentatus* has a smooth cuticle. Schiffner<sup>6</sup> suggests that *Jungermannia asperifolia* Tayl. and *Cephalozia asperifolia* C. Jens. may possibly be identical. Of course, if this should ever be proved to be the case, the name *asperifolia* could then be revived for the present species.

11. ANTHOCEROS CAROLINIANUS Michx. Fl. Bor.-Amer. 2: 280. 1803. On a log, at the border of a pond. New Haven, Connecticut (G. E. Nichols). In Howe's monograph on the Anthocerotaceae of North America he cites sterile specimens of an *Anthoceros* from New Haven, collected by D. C. Eaton, which he refers somewhat doubtfully to *A. carolinianus*.<sup>7</sup> The present specimens are fertile and agree

<sup>1</sup> Bull. Soc. Bot. France 52: 147. 1905.

<sup>2</sup> Hep. Amaz. et And. 508 (footnote). 1885. (= *Jungermannia asperifolia* Tayl. Lond. Jour. Bot. 5: 277. 1846.)

<sup>3</sup> On Cephalozia 83. 1882.

<sup>4</sup> Bull. de l'Herb. Boissier II. 8: 508. 1908.

<sup>5</sup> Godman's Nat. Hist. Azores 318. 1870.

<sup>6</sup> Oesterr. Bot. Zeitschr. 55: (6). 1905.

<sup>7</sup> Bull. Torrey Club 24: 7. 1898.



closely with Howe's description and with authentic material, so that the species may now be definitely recorded as a member of the New England flora. As Howe explicitly states, *A. carolinianus* is very close to *A. levis* L. and ought perhaps to be regarded as an aquatic or subaquatic modification of the commoner species. It is, however, considerably larger, the involucre is longer and scarcely or not at all expanded at the mouth, and the capsules are relatively more slender. In other respects the two species are much the same. The range of *A. carolinianus* is typically southern and Howe reports it from numerous localities in the Southern States.

The additions to local state floras, not already mentioned in the preceding pages, are as follows:—

For Maine. *Pallavicinia Flotowiana*, *Pellia Neesiana*, *Cephaloziella elachista*, *Scapania apiculata*, and *S. subalpina*; Round Mountain Lake and vicinity, Franklin County (Miss Lorenz).

For Vermont. *Calypogeia sphagnicola*, *C. tenuis*, *Cephalozia fluitans*, and *Lophozia marchica*; Franklin (Miss Lorenz). *Scapania curta*; Rochester (D. L. Dutton). It should be noted also that the Vermont record for *Lepidozia setacea* may now be definitely marked with the sign "+", the necessary specimens having been collected by Miss Lorenz.

For Massachusetts. *Cephaloziella Sullivantii*; Reading (C. C. Kingman). *Lophocolea minor*; Stoneham and Woburn (C. C. Kingman).

For Rhode Island. In Bennett's "Plants of Rhode Island," published in 1888, the following species of Hepaticae are among those recorded: *Riccia lamellosa*, *Fossombronia angulosa*, *Jungermannia Helleriana*, *Lejeunea serpyllifolia*, *L. echinata*, and *Radula tenax*. These species were all omitted from the writer's "Preliminary List of New England Hepaticae,"<sup>1</sup> because there was so much uncertainty about them. It is perhaps advisable, however, to record them with the sign "—". If this is done *Riccia lamellosa* should be listed as *R. Austini*, *Fossombronia angulosa* as *F. salina*, *Jungermannia Helleriana* as *Sphenolobus Hellerianus*, *Lejeunea serpyllifolia* as *L. cavifolia*, and *L. echinata* as *Cololejeunea Biddlecomiae*. Another species, reported by Bennett under the name *Coleochila Taylora* is cited in the "Preliminary List" as *Mylia Taylora*. This probably represents *M.*

<sup>1</sup> RHODORA 5: 170-173. 1903.



*anomala* and should be so listed. There are still twenty-five Rhode Island species which are known to the writer through published records only.

For Connecticut. *Lophozia marchica*; Bethany (*Miss Lorenz*).

The census of New England Hepaticae now stands as follows: Total number of species recorded, 177; number recorded from Maine, 123; from New Hampshire, 130; from Vermont, 109; from Massachusetts, 96; from Rhode Island, 77; from Connecticut, 134; common to all six states, 52.

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## A NORTHEASTERN VARIETY OF *CHELONE GLABRA*.

M. L. FERNALD AND K. M. WIEGAND.

THE common *Chelone glabra* from New England to Kentucky and the region of the Great Lakes has leaves of a more or less lanceolate outline, gradually tapering to a long slender tip and ordinarily narrowed to a very short-petioled base. This common plant, judging from the Linnean description, "*Chelone foliis lanceolatis serratis*,"<sup>1</sup> is typical *C. glabra*.

In Newfoundland, Prince Edward Island, northern Maine and Quebec, however, specimens of *Chelone* show a general tendency toward a more oblong-ovate outline of the leaves and lower bracts. The bases of the upper leaves and foliaceous bracts are also commonly rounded or even occasionally subcordate. On comparing this broad-leaved northern extreme with the more southern typical *C. glabra* it becomes apparent that in a majority of the specimens of the broad-leaved extreme the leaves increase in size to the base of the inflorescence, while in the plant with the lanceolate leaves tapering to the petiole the leaves at or near the middle of the stem are larger than those above. Occasional specimens in each series, however, occur with the middle and upper leaves nearly uniform in size. The outline of the leaves is somewhat variable in each series, showing occasional transitions, so that, although the majority of the specimens

<sup>1</sup> L., Sp. Pl. 611 (1753).